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INTERNATIONAL SCIENTIFIC COMMITTEE ON ENERGY
HEALTH AND THE ENVIRONMENT

INTRODUCTION

Energy production and use are today a major source of environmental problems in many countries; many perceive it as the problem. Each existing and new energy technology -- from coal gasification to solar, electric and thermonuclear fusion -- will exact a health and environmental price. The demand for energy in industrialized and developing countries entails a hard review of acceptable risk and biological cost. Quantitative data are therefore important as to biomedical and environmental effects of energy production and use, and will be even more important in determining the balance between energy needs and health, environmental concerns, and other relevant factors.

Health and environmental consequences of energy production and use have important world impacts; e.g., sulfur dioxide and sulfates from fossil fuel combustion move in the atmosphere across national boundaries. This problem now causes intense anxiety among European nations. Carbon dioxide from fossil fuels may have long-term global, and particulates from fossil fuels may have regional effects on climate of concern to all countries.

Decisions on health and environmental risks in one country may strongly affect other countries. In general, national decisions on environmental standards for energy production and use will affect the terms of trade not only for energy products, but

also for many other commodities requiring substantial energy inputs. For example, an American decision to restrict nuclear power on health and environmental grounds would affect nuclear power development through the world; similarly, an American decision to restrict coal development would also, through the increased reliance on other energy sources, have an impact on natural gas, oil and uranium for all countries.

The comprehensive assessment of health and environmental costs is thus an important element for setting energy policies nationally and internationally. Each link in an energy system (see Figure 1), from exploration, and extraction of energy resources to final end-use, may have health and environmental impacts. A decision to generate electricity by burning coal rather than by using a nuclear reactor, for example, involves health and environmental trade-offs throughout the entire fuel cycle. Quantitatively these trade-offs are important in setting research and development priorities and in preparing regulatory measures.

For nuclear power, we have extensive--though in some areas still controversial--assessments of health and environmental risks. Largely as a result of concern with nuclear weapons, much effort was expended in reaching international consensus on quantitative assessments of the sources, pathways, levels, effects, and risks of radiation exposure. Summarized in the reports of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and in the reports of various national committees, this knowledge of radiation effects and risks may figure importantly in debates over nuclear power.

What is lacking is an authoritative international consensus assessment on the hazards of the fossil fuel cycles and on parts of the nuclear fuel cycle, i.e., realistic comparisons between direct and indirect costs of different fuel cycles. Such assessments offer great advantages: internationally they would provide a common data base for energy-related decisions requiring international agreements; nationally international consensus assessments would provide an authoritative basis for government decisions.

SCOPE

The proposed international activity would aim at developing a systematic assessment world wide of the health and environmental costs of energy production and use. All forms of energy including new or adapted technologies, would be considered. Starting with a compilation of residuals from the energy system, the various pathways to man would be traced. This task would entail definition of transport mechanisms of pollutants including chemical conversions and various links through the biosphere to man. An evaluation would then be made of effects. The initial focus would be on biomedical effects (occupational and public) and environmental effects on animals, crops, and other vegetation and on land, known to affect man. The assessment would rely on available information; epidemiological data, field and laboratory studies carried out on appropriate animals and vegetation; and basic biomedical research designed to elucidate molecular and cellular mechanisms underlying biological responses to various residuals.

By taking account of the magnitude of energy flow through the system and of the populations exposed, total effects would be calculated.

A simplified version of the reference energy framework provides a logical approach toward quantitative assessments (Figure 1) and provides an essential principle of the proposed activity: health and environmental effects of individual energy technologies (for industrially developed countries as well as for LDC's) can be assessed only through assessment of the entire energy system. The framework would break down the energy system into production, distribution, and utilization activities, thereby permitting analysis of costs and hazards at each stage. The framework includes (1) hydro-power; (2) nuclear fuel; (3) coal; (4) oil; (5) natural gas; and (6) future energy sources. Processing of these energy sources entails: (1) exploration and extraction; (2) refining and conversion; (3) transport; (4) central station conversion; (5) transmission and distribution; (6) decentralized conversion; and (7) conversion by final energy uses. Most of these steps present biomedical, environmental, and other costs, e.g., release of pollutants into air, water, and thence into food-chains. The residuals (including pollutants) arising from various process steps have direct biomedical effects and environmental effects on animals, vegetation, aesthetics, soiling, land use, resource depletion, and materials.

With experience gained from these assessments, other environmental effects would be included in the assessment. These could include long-term ecological dislocations that may subject man to new health hazards or may deprive him of "natural biological

services" (provision of food-stuffs, recycling of wastes, fixation of nitrogen and generation of oxygen, stabilization and building of soil, etc., etc.), as well as physical environmental changes of long-range nature (climatological or hydrological effects, etc.) and other physical/ecological changes primarily of aesthetic or recreational concern.

The first task of the Committee would be to define the scope and the priorities for analysis. What are the methods of comparing effects of risks of the different energy sources? At an early stage, the Committee will provide a catalogue and summary of methods currently in use and an evaluation of these.

The proposed international assessment will thus entail the integration of the best available information into an assessment of the total health (occupational and public) and environmental consequences of energy production and use. These data will be assembled into quantitative models which will allow comparison of the health and environmental effects of present and of alternative patterns of energy development for different regions of the world including both industrially developed countries and LDCs. We recognize that at present this assessment can be made only in preliminary form. By recognizing uncertainties in each impact, however, the areas most in need of refinement would be identified. Such an international assessment would provide information on the health and environmental consequences required for policy regarding alternative energy systems, R & D priorities and guide allocation of resources for programs of health and environmental research, nationally and internationally. Quantification of

health and environmental trade-offs throughout the entire fuel cycle combined with trade-offs of social and economic impacts is important in setting research and development priorities and regulating measures. The proposed international assessment activity would be of use in the development (by appropriate groups) of international codes and standards for environmental protection for energy production and use.

IMPLEMENTATION

The assessment of the health and environmental impacts of energy production and use would be made by an International Scientific Committee operating in a way analogous to although not institutionally identical with the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).^{*} The Committee operates with the assistance of a Secretary and Scientific Staff appointed by the Secretary General of the United Nations. Thus, the Committee works with a small core of whole-time personnel -- in this case, one Secretary (the only long-term continuing professional staff member) who recruits other

^{*}This Committee of the United Nations, established by the General Assembly by its resolution 913(x) of 3 December 1955, entrusted with the compilation and wide distribution of all scientific data on the short-term and long-term effects upon man and his environment of ionizing radiation, originally consisted of representatives (mostly experts on various radiation fields) from Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, Egypt, France, India, Japan, Mexico, Sweden, the USSR, the UK, and the USA. As a result of the decision of the General Assembly by its resolution 3154C (XXVIII) of 14 December 1973, that the size of the Committee be increased by up to 5 additional members, the Committee currently consists of one scientist, with alternates and advisors as appropriate, designated by each of 20 Member States.

working scientists as full-time consultants for a period of three months to one or two years. These are recognized specialists in their fields and are therefore usually able to produce a good working draft for review. The drafts are then considered by the Committee. The demonstrated effectiveness of this Committee makes this mechanism a useful model and it is this way of operating that is being proposed for the International Scientific Committee on Energy, Health, and the Environment (ISCEHE).

Members of the Scientific Committee would be leading scientists in the various fields related to the assessment of health and environmental impacts of energy production and use. As with UNSCEAR, membership on the Committee should correspond primarily to the scientific background and competence of individual scientists in the area to be assessed. As what is being proposed is a Scientific Committee, membership of the Committee need not be restricted to members of any potential sponsoring international organizations, e.g., OECD and WHO. Since the scope of the scientific assessment to be undertaken by the Committee would include consideration of the health and environmental effects of energy technologies existing, new and adapted, membership of the Committee would include scientists with appropriate competence in these areas. The crucial point about the proposed mechanism is that the Scientific Committee would be supported and operated with only a small core of full-time scientific personnel who would recruit other working scientists to work for three months to one-two years to produce realistic working drafts for review by

the Committee. As with UNSCEAR, the Committee's secretariat would assemble and tabulate the information in a form suitable for the Committee's consideration and provide supporting services to the Committee during its sessions. The actual attendance at Scientific Committee meetings could change depending on the scientific area under review, e.g., if meteorology and climate considerations were to be reviewed, the Committee would include outstanding meteorologists and experts on climate. Similarly, if health effects were to be considered, the Committee would include epidemiologists, toxicologists, and other appropriate health scientists.

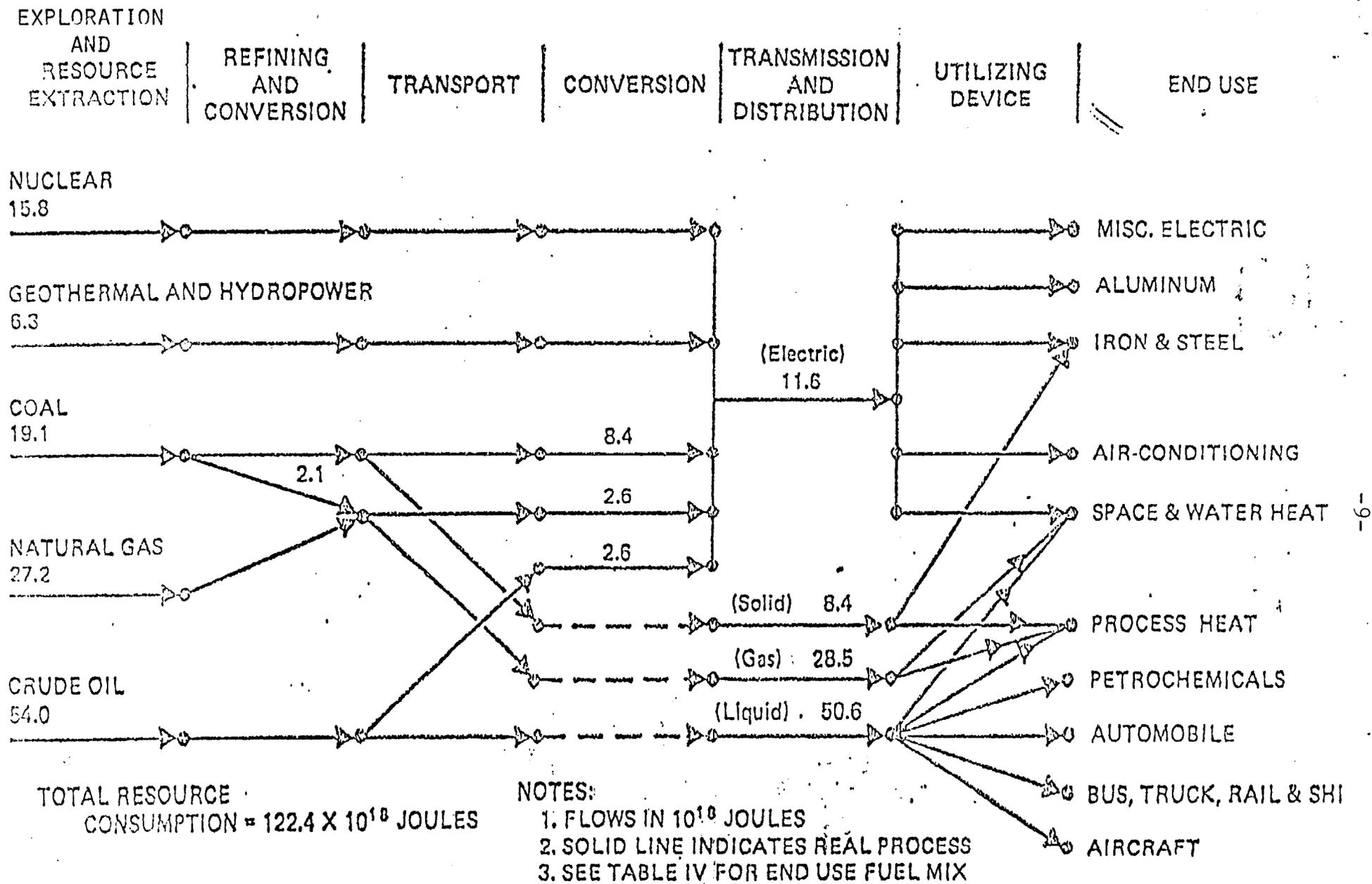


FIGURE 1:

ENERGY SYSTEM NETWORK (1985 Base Case Projection)